

**What is claimed is:**

1. A pre-deployment configuration for a primary stenting system for placing a stent within a stenosis of a vessel in a human body, the system comprising:

a flexible guide wire;

a balloon angioplasty catheter having a distal portion, the balloon angioplasty catheter having an inflatable balloon located at its distal portion, the inflatable balloon having a proximal end and a distal end, the balloon angioplasty catheter also having a lumen through which the guide wire can be slideably moved, the balloon angioplasty catheter also having a distal tip which extends in the distal direction from the distal end of the balloon to the distal end of the balloon angioplasty catheter, the distal tip having a proximal end and a distal end,

a stent coaxially mounted around the inflatable balloon of the balloon angioplasty catheter the stent having a proximal end and a distal end; and

a sheath generally in the form of a cylindrical tube that is coaxially located around the balloon angioplasty catheter with its coaxially mounted stent, the sheath having a proximal section and an ultra-thin distal section, the proximal section of the sheath having a proximal end and a distal end, the ultra-thin distal section of the sheath having a proximal end and a distal end, the proximal end of the ultra-thin distal section of the sheath being fixedly attached to the distal end of the proximal section of the sheath, the ultra-thin distal section of the sheath being shrunk down onto the distal portion of the balloon angioplasty catheter including its coaxially mounted stent, the sheath being adapted to be slideably retracted in a proximal direction so that the distal end of the ultra-thin section of the sheath lies proximal to the balloon so that the stent can be radially expanded when the balloon is inflated.

2. The system of claim 1 wherein the wall thickness of the proximal section of the sheath is more than twice the wall thickness of the ultra-thin distal section.

3. The system of claim 1 wherein the wall thickness of the ultra-thin distal section of the sheath is less than 0.05 mm.

4. The system of claim 1 wherein the wall thickness of the ultra-thin distal section of the sheath is less than 0.025 mm

5. The system of claim 1 wherein the ultra-thin distal section of the sheath is made from a heat shrinkable plastic.

6. The system of claim 1 wherein the ultra-thin distal section is made of nylon.

7. The system of claim 1 wherein the ultra-thin distal section of the sheath is made from a solvent swellable material.

8. The system of claim 1 wherein the ultra-thin distal section of the sheath is lubricity coated.

9. The system of claim 1 wherein the distal tip is more than 10 mm long.

10. The system of claim 1 wherein the distal tip is more than 20 mm long.

11. The system of claim 1 wherein the distal tip is tapered from a larger diameter at its proximal end to a smaller diameter at its distal end.

12. The system of claim 11 wherein the distal tip has an average taper of less than 4 degrees from its distal end to its proximal end.

13. The system of claim 1 wherein the balloon angioplasty catheter further comprises a coaxially mounted elastomer band placed coaxially over the angioplasty catheter just proximal to the stent, the elastomer band being adapted to prevent the stent from sliding in a proximal direction.

14. The system of claim 13 wherein the elastomer band includes a high density material for increased radiopacity.

15. The system of claim 13 wherein the elastomer band has a proximal end and a distal end and the distal end of the proximal section of the sheath is adapted to provide distally directed push force against the proximal end of the elastomer band.

16. The system of claim 13 wherein the balloon angioplasty catheter further comprises a coaxially mounted distal elastomer band placed coaxially over the angioplasty catheter just distal to the stent, the distal elastomer band being adapted to prevent the stent from sliding in a distal direction.

17. The system of claim 16 wherein the distal elastomer band includes a high density material for increased radiopacity.

18. The system of claim 1 further comprising an elastomer securing tube having a proximal section and a distal section, the distal section being fixedly attached to the distal end of the distal tip and the proximal section of the elastomer securing tube being placed over the distal end of the ultra-thin section of the sheath.

19. The system of claim 1 wherein the primary stenting system is an over-the-wire stent delivery catheter system.

20. The system of claim 1 wherein the primary stenting system is a rapid exchange stent delivery catheter system.

21. A pre-deployment configuration for a primary stenting system for placing a stent within a stenosis of a vessel in a human body, the system comprising:

a flexible guide wire;

a balloon angioplasty catheter having a distal portion, the balloon angioplasty catheter having an inflatable balloon located at its distal portion, the inflatable balloon having a proximal end and a distal end, the balloon angioplasty catheter also having a lumen through which the guide wire can be slideably moved, the balloon angioplasty catheter also having a distal tip which extends in the distal direction from the distal end of the balloon to the distal end of the balloon angioplasty catheter, the distal tip having a proximal end and a distal end,

a stent coaxially mounted around the inflatable balloon of the balloon angioplasty catheter;

a sheath generally in the form of a cylindrical tube that is coaxially located around the balloon angioplasty catheter with its coaxially mounted stent, the sheath having an ultra-thin distal section, the ultra-thin distal section of the sheath being shrunk down onto the distal portion of the balloon angioplasty catheter including its coaxially mounted stent, the distal end of the shrunk down ultra-thin distal section being situated between the distal end of the angioplasty balloon and the distal end of the distal tip; and

an elastomer securing tube having a proximal section and a distal section, the distal section being fixedly attached to the distal end of the distal tip of the balloon angioplasty catheter and the proximal section of the elastomer securing tube being adapted to cover the distal end of the ultra-thin section of the sheath, the sheath being adapted to be slideably retracted in a proximal direction from under the securing tube.

22. The system of claim 21 wherein the wall thickness of the securing tube is less than 0.05mm.

23. The system of claim 21 wherein the wall thickness of the securing tube is less than 0.025 mm.

24. The system of claim 21 wherein the wall thickness of the ultra-thin distal section of the sheath is less than 0.05 mm.

25. The system of claim 21 wherein the wall thickness of the ultra-thin distal section of the sheath is less than 0.025 mm

26. The system of claim 21 wherein the ultra-thin distal section of the sheath is made from a heat shrinkable plastic.

27. The system of claim 21 wherein the ultra-thin distal section is made of nylon.

28. The system of claim 21 wherein the securing tube is made of nylon.

29. The system of claim 21 wherein the ultra-thin distal section of the sheath is made from a solvent swellable material.

30. The system of claim 21 wherein the ultra-thin distal section of the sheath is lubricity coated.

31. The system of claim 21 wherein the distal tip is more than 10 mm long.

32. The system of claim 21 wherein the distal tip is more than 20 mm long.

33. The system of claim 21 wherein the primary stenting system is an over the wire device.

34. The system of claim 21 wherein the primary stenting system is a rapid exchange stent delivery catheter system.

35. The system of claim 21 wherein the distal tip is tapered from a larger diameter at its proximal end to a smaller diameter at its distal end.

36. The system of claim 35 wherein the distal tip has an average taper of less than 4 degrees from its distal end to its proximal end.

37. The system of claim 21 wherein the balloon angioplasty catheter further comprises a coaxially mounted elastomer band placed coaxially over the angioplasty catheter just proximal to the stent, the elastomer band being adapted to prevent the stent from sliding in a proximal direction when the sheath is slideably retracted in a proximal direction.

38. The system of claim 38 wherein the elastomer band includes a high density material for increased radiopacity.

39. The system of claim 38 wherein the balloon angioplasty catheter further comprises a coaxially mounted distal elastomer band placed coaxially over the angioplasty catheter just distal to the stent, the distal elastomer band being adapted to prevent the stent from sliding in a distal direction after the sheath has been slideably retracted in a proximal direction.

40. The system of claim 39 wherein the distal elastomer band includes a high density material for increased radiopacity.

41. A pre-deployment configuration for a primary stenting system for placing a stent within a stenosis of a vessel in a human body, the system comprising:

a flexible guide wire;

a balloon angioplasty catheter having a distal portion, the balloon angioplasty catheter having an inflatable balloon located at its distal portion, the inflatable balloon having a proximal end and a distal end, the balloon angioplasty catheter also having a flexible, distal tip having a distal end and a proximal end and also having a lumen through which the guide wire can be slideably moved;

a stent coaxially mounted around the inflatable balloon of the balloon angioplasty catheter;

a coaxially mounted proximal elastomer band situated over the portion of the balloon angioplasty catheter that lies just proximal to the stent; and

a coaxially mounted distal elastomer band situated over the portion of the balloon angioplasty catheter that lies just distal to the stent, the proximal and distal elastomer bands being adapted to prevent the coaxially mounted stent from sliding off of the inflatable balloon in either a proximal direction or a distal direction.

42. The system of claim 41 wherein the distal tip is more than 10 mm long.

43. The system of claim 41 wherein the distal tip is more than 20 mm long.

44. The system of claim 41 wherein the distal tip has a gentle taper from a larger diameter at the proximal end of the distal tip to a smaller diameter at the distal end of the distal tip the gently tapered distal tip and distal elastomer band together forming a smooth outer surface to facilitate penetration of a tight stenosis.

45. The system of claim 44 wherein the gradually tapered distal tip has an average taper of less than 4 degrees from its distal end to its proximal end.

46. The system of claim 44 wherein the gently tapered distal tip, distal elastomer band and proximal elastomer band are each lubricity coated.

47. The system of claim 41 wherein the proximal and distal elastomer bands each include a high-density material for increased radiopacity.

48. A pre-deployment configuration for a primary stenting system for placing a stent within a stenosis of a vessel in a human body, the system comprising:

a flexible guide wire;

a balloon angioplasty catheter having a distal portion, the balloon angioplasty catheter having an inflatable balloon located at its distal portion, the inflatable balloon having a proximal end and a distal end, the balloon angioplasty catheter also having a flexible, gradually tapered distal tip having a distal end and a proximal end and also having a lumen through which the guide wire can be slideably moved, the gradually tapered distal tip having a tapered proximal portion and a tapered distal portion, both proximal and distal portions of the gradually tapered distal tip having a gradual taper; and

a stent coaxially mounted around the inflatable balloon of the balloon angioplasty catheter;

a sheath generally in the form of an elongated cylinder that is coaxially located around the balloon angioplasty catheter, the sheath having a proximal section and an ultra-thin distal section, the proximal section of the sheath having a proximal end and a distal end, the ultra-thin distal section of the sheath having a proximal end and a distal end, the proximal end of the ultra-thin distal section of the sheath being fixedly attached to the distal end of the proximal section of the sheath, at least a portion of the ultra-thin distal section being shrunk onto the stent and also onto the tapered proximal portion of the gradually tapered distal tip, the sheath being adapted to be slideably retracted in a proximal direction so that the distal end of the ultra-thin section of the sheath can be placed proximal to the balloon so as to allow balloon expansion for radial expansion of the stent.

49. The system of claim 48 wherein the wall thickness of the proximal section of the sheath is greater than the wall thickness of the ultra-thin distal section.

50. The system of claim 48 wherein the wall thickness of the ultra-thin distal section of the sheath is less than 0.05 mm.

51. The system of claim 48 wherein the wall thickness of the ultra-thin distal section of the sheath is less than 0.025 mm

52. The system of claim 48 wherein the ultra-thin distal section of the sheath is heat shrinkable.

53. The system of claim 48 wherein the ultra-thin distal section is made of nylon.

54. The system of claim 48 wherein the ultra-thin distal section of the sheath is made from a solvent swellable material.

55. The system of claim 48 wherein the ultra-thin distal section of the sheath is lubricity coated.

56. The system of claim 48 wherein the gradually tapered distal tip is lubricity coated.

57. The system of claim 48 wherein the ultra-thin distal section of the sheath is lubricity coated.

58. The system of claim 48 wherein the gradually tapered distal tip is more than 10 mm long.

59. The system of claim 48 wherein the gradually tapered distal tip is more than 20 mm long.

60. The system of claim 48 wherein the tapered proximal portion of the gradually tapered distal tip has a length that is at least 25% of the length of the gradually tapered distal tip.

61. The system of claim 48 wherein the gradually tapered distal tip has a taper of less than 4 degrees from its distal end to its proximal end.

62. The system of claim 48 wherein the balloon angioplasty catheter has a coaxially mounted proximal elastomer band over the portion of the angioplasty balloon that lies proximal

to the stent, the proximal elastomer band being adapted to prevent the stent from sliding in a proximal direction.

63. The system of claim 62 wherein the proximal elastomer band includes a high density material for increased radiopacity.

64. The system of claim 48 wherein the balloon angioplasty catheter has a coaxially mounted distal elastomer band over the portion of the angioplasty balloon that lies distal to the stent, the distal elastomer band being adapted to prevent the stent from sliding in a distal direction.

65. The system of claim 64 wherein the distal elastomer band includes a high density material for increased radiopacity.

66. The system of claim 62 wherein the balloon angioplasty catheter also has a coaxially mounted distal elastomer band over the portion of the angioplasty balloon distal to the stent, the distal elastomer band being adapted to prevent the stent from sliding in a distal direction, the ultra-thin distal section of the sheath being shrunk down over the distal elastomer band, the proximal elastomer band, the stent and the tapered proximal portion of the gradually tapered distal tip.

67. The system of claim 66 wherein the proximal elastomer band and distal elastomer band each include a high density material for increased radiopacity.

68. The system of claim 48 further comprising an elastomer securing tube having a proximal section and a distal section, the distal section being fixedly attached to the tapered distal portion of the tapered distal tip and the proximal section of the elastomer securing tube being placed snugly over the distal end of the ultra-thin section of the sheath.